Name _____

ELEMENTS OF PHYSICS
WAVES: SOUND AND ELECTROMAGNETISM

Pre-Test

Directions: This will help you discover what you know about the subject of waves before you begin this lesson. Answer the following true or false.

1. All waves are traveling disturbances that carry energy from place to place. T_____ F_____.
2. Wave frequency is the distance of one complete wave. T_____ F_____.
3. Velocity is the speed of the wave. T_____ F_____.
4. Sound is a form of energy transmitted by longitudinal waves. T_____ F_____.
5. Sound waves do not need a medium to travel. T_____ F_____.
6. Sound cannot travel through solid material. T_____ F_____.
7. Explosions, earthquakes, and sound are similar in that they are all longitudinal waves. T_____ F_____.
8. Electromagnetic waves cannot be distorted. T_____ F_____.
9. A sound echo and an image in a mirror are both examples of reflected waves. T_____ F_____.
10. The Doppler effect is the same as a reflected wave. T_____ F_____.

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Vocabulary Definitions

The following words and terms used in the program may be unfamiliar to you. Try to listen for these terms while viewing the program, pay close attention so you can later include them in your scientific descriptions, observations, and creative writing assignment activities.

amplitude - maximum difference of the wave disturbance, often called the height of the wave.

compression wave - see longitudinal wave.

constructive interference - when the wave interference is in the same direction. This tends to amplify the disturbance.

destructive interference - when the wave interference is in opposite directions. This reduces the disturbance.

Doppler effect - the apparent change in the pitch of the wave caused by the source of the wave approaching the observer and then receding away from the observer.

Einstein, Albert - German-American physicist, 1879 - 1955.

elasticity - the density of the medium.

electromagnetic waves - waves of electricity and magnetism, often called light.

energy - in physics, the capacity to do work.

ether - it was once believed there was ether in space that was the medium which allowed light to travel. It is now known that space is a vacuum.

frequency - number of wave cycles in a given unit of time. It is often expressed in hertz, or Hz.

longitudinal wave - this wave is created when molecules of the medium are pushed back and forth parallel to the direction of the wave motion. Longitudinal waves are sometimes called compression waves. The energy of sound, explosions, and earthquakes are all transmitted by longitudinal waves.

medium - an intervening substance that allows energy to pass, such as air, water, or solid materials.

photons - sub-atomic particles of energy and matter propagated by electromagnetic waves.

pitch - in music, the higher or lower the pitch, the higher or lower the note. Pitch is determined by the frequency of the sound waves.

reflected waves - waves that change direction when they bounce off a barrier.

refraction - waves that appear to bend when they go from one medium to another.

resonance - objects that will vibrate and produce waves have resonance.

standing wave - successive waves that interfere with each other so that, in effect, they stand still.

transverse waves - waves that travel up and down like waves on the surface of water. Electromagnetic waves are transverse waves.

velocity - speed of the wave. Velocity is determined by multiplying wavelength and frequency.

wave - traveling disturbance of energy.

wave interference - when two waves meet while traveling in the same medium.

wavelength - distance of one complete wave cycle.

wave-particle duality - the theory that electromagnetism is made up of both energy and particles of matter called photons.

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Use the Right Word

Directions: Find the right word from the physics vocabulary list that completes the following sentences.

1. A traveling disturbance of energy is called a _____.
2. The number of wave cycles in a unit of time is called the wave _____.
3. A _____ is an intervening substance that allows energy to pass.
4. The energy of sound, explosions, and earthquakes are all propagated by _____ waves.
5. Electromagnetism is propagated by _____ waves.
6. The density of the medium is called its _____.
7. _____ are sub-atomic particles of energy and matter propagated by electromagnetic waves.
8. Waves that change direction when they bounce off a barrier are _____ waves.
9. In music, the frequency of the sound waves determine its _____.
10. The theory that electromagnetism is made up of both energy and sub-atomic particles is called the _____ .

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Word Match

Directions: Connect the word with the proper definition.

amplitude	speed of the wave
elasticity	determined by the frequency of the sound waves
frequency	density of the medium
longitudinal	height of the wave
medium	distance of one complete wave cycle
pitch	waves that travel up and down
transverse	disturbance of energy
velocity	waves created by the movement of molecules
wave	wave cycles in a given unit of time
wavelength	allows energy to pass through

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Connected/Not Connected

Directions: Place the following words in the proper sentences.

amplitude	echoes	height	reflected
atmosphere	electromagnetic	light	tranverse
Doppler	energy	longitudinal	vacuum
Earth	explosions	medium	wavelength
earthquakes	frequency	pitch	waves

1. _____ are connected to _____ because they are the means by which disturbances are transported.

2. _____ is NOT connected to _____ because one is the distance of one complete wave and the other is the number of wave cycles in a given time.

3. _____ is connected to wave _____ because it is the maximum difference of the disturbance.

4. A _____ is NOT connected to a _____ because the complete absence of matter will not allow longitudinal waves to travel through its space.

5. _____ and _____ are connected because, like sound, they are propagated by longitudinal waves.

6. The _____ is NOT connected to _____ because solid material is a medium that allows longitudi nal waves to travel much faster than the air.

7. _____ waves are connected to _____ because these waves transport electricity and magnetism, which allows us to see.

8. _____ waves are NOT connected to _____ waves because one type of wave needs a medium to transport the energy and the other type of wave does not.

9. _____ are connected to _____ waves because they are waves that bounce off a barrier.

10. The _____ effect is NOT connected to constant _____ because the sound changes as it moves towards the observer and then retreats away from the observer.

Name _____

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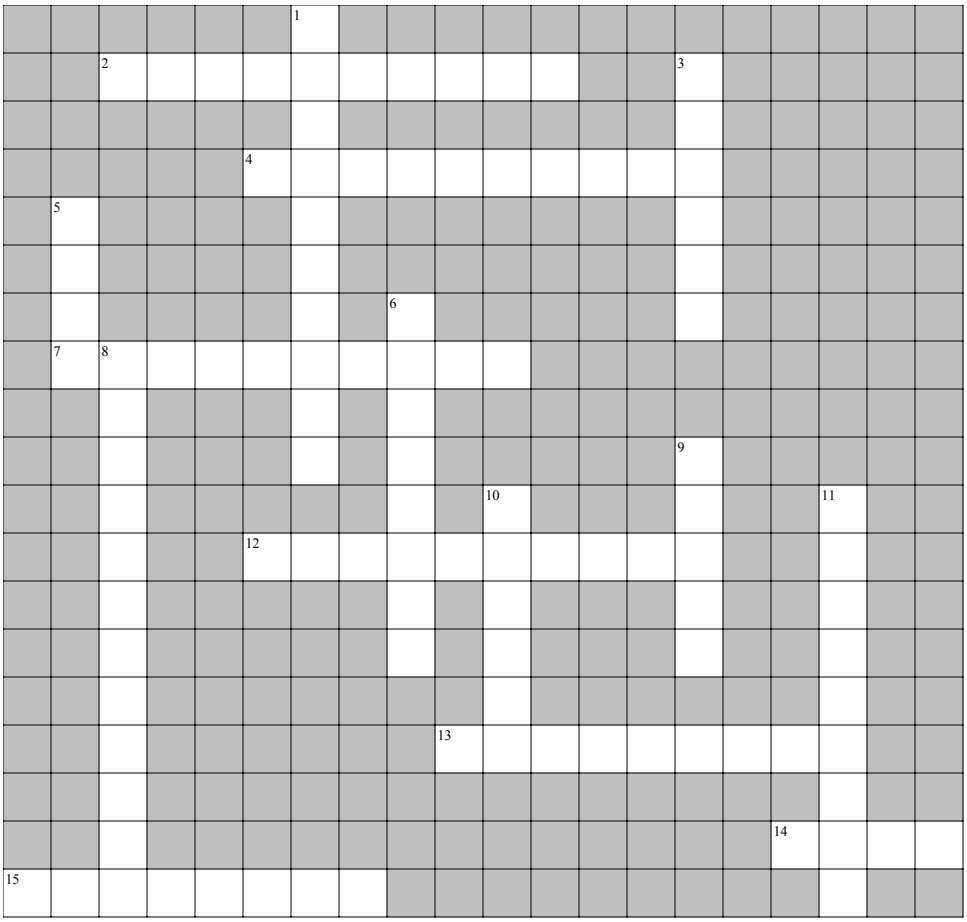
Crossword Puzzle



Across

2. waves bouncing off a barrier
4. electromagnetic waves are _____ waves
7. the density of the medium
12. distance of one complete wave
13. the height of the wave
14. reflected sound
15. speed of the wave

Down

1. distance of one complete wave
3. the capacity to do work
5. traveling disturbance of energy
6. German-American physicist 1879 - 1955
8. sound waves are _____ waves
9. space was once believed to be filled with this
10. intervening substance that allows waves to pass
11. number of wave cycles in a given unit of time

Name _____

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Creative Writing Story Ideas

Directions: Choose from one of the ideas listed below and write a story or dramatization. Include plot lines that follow scientific principles and key vocabulary terms.

1. Early one morning a group of surfers waits on a beach for the surf to come up. Different characters offer their views on the nature and causes of the surf and how waves affect them personally. Write a movie script showing their views and illustrating the characters.

2. A quartet of rock musicians has been asked to play a concert with a symphony orchestra. What happens?

3. Five astronauts are stranded on the moon. They have a good supply of food and oxygen, which they breathe through a mouth apparatus, but they discover that they cannot hear each other talk because of the lack of atmosphere on the moon's surface. Write a story showing how their relationships change in the months before a rescue ship arrives.

4. You are studying the speed earthquake disturbances travel through the Earth when you discover a way of determining when an earthquake will occur and its destructive effects. Your calculations determine that a quake will destroy a town of 5,000 people in three weeks time. You rush to tell the town officials but they think you just are a crazy scientist. Describe how you solve this dilemma.

5. A strange echo, that seems to have no source, is emanating from a nearby mountain. A group of students is sent out to determine its cause.

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Video Quiz

Directions: Answer the following true or false, or fill in the blank with the correct word to make it true.

1. Waves transport the energy of disturbances. T_____ F_____.
2. The number of wave cycles in a given unit of time is called the wave _____.
3. The speed of the wave is called its _____.
4. Sound waves are longitudinal waves. T_____ F_____.
5. Longitudinal waves never need a medium to transport the energy. T_____ F_____.
6. Sound travels faster in the air than in the ground. T_____ F_____.
7. Visible light is transported by _____ waves.
8. The Doppler effect only applies to sound waves. T_____ F_____.
9. Echoes of sound and mirror images are examples of refracted waves. T_____ F_____.
10. All waves can be distorted, deflected, or changed. T_____ F_____.

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Post-Test

Vocabulary
Directions: Fill in the blank with the appropriate term from the list below.

amplitude	frequency	reflected	velocity
Doppler	height	refracted	vibrations
echo	longitudinal	standing wave	wave
electromagnetic	medium	tranverse	wave height
explosions	pitch	vacuum	wavelength

1. The energy of sound, explosions, and earthquakes are all transported by _____ waves.

2. The energy of visible light is transported by electromagnetic waves, which are _____ waves.

3. Sound echoes are _____ waves.

4. The _____ effect occurs when the pitch of the sound is higher as the source approaches the listener and is lower when it retreats away from the listener.

True or False
Directions: Fill in the blank with true or false. If the statement is false, change it to make the statement true. Rewrite the true statement on the lines provided.

5. _____ Wavelength is the number of wave cycles in a given unit of time.

6. _____ Sound waves need a medium to be propagated.

7. _____ Amplitude is the speed of the wave.

8. _____ Electromagnetic waves cannot travel through a medium.

9. _____ Electromagnetic waves are only energy and have no matter.

Essay Section
Directions: Answer the following questions in complete sentences. Use the back of this page or a separate sheet of paper if you need more space to complete your answer.

10. Why does sound travel more quickly in water than in air?

11. What are photons?

12. Explain the similarity between echoes of sound and images in a mirror.

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